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Were they engraved ? Cave art taphonomy in the Lesser Antilles, *working hypotheses*



A. Lenoble¹ - A. Queffelec¹ – C. Stouvenot² - P. Mora³ - P. Fouéré⁴

- 1) UMR 5199 PACEA – CNRS – Université Bordeaux1 – Bât B18 Avenue des Facultés 33405 TALENCE Cedex
- 2) Direction des affaires culturelles de Guadeloupe - 28, rue Perrinon - 97 100 BASSE TERRE
- 3) Archéotransfert - UPS 3551 Archéovision - Université Bordeaux 3 - 33 600 PESSAC
- 4) INRAP GSO et Dom Tom - 210 cours Victor Hugo - 33 130 BEGLES

Corresponding author: a.lenoble@pacea.u-bordeaux1.fr

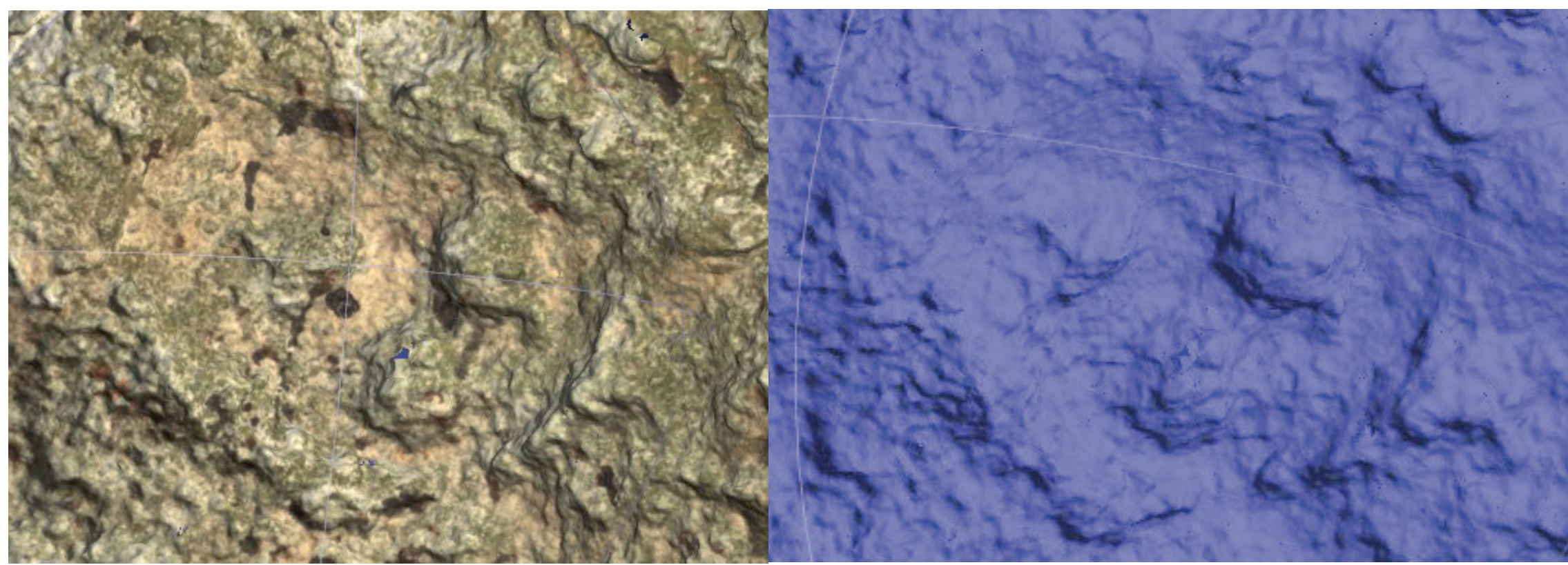
Because decorated caves are old one to two thousand years at most, the influence of wall degradation is not considered to play an important role in the distribution of Amerindian art caves in the Lesser Antilles.

We argue here the opposite hypothesis, that many sites in tropical coastal environment, may experience a very rapid evolution of the walls, fast enough to eliminate much if not all paintings and engravings.

This hypothesis is advanced on the basis of the study of the Blanchard Cave compared to that of the richly decorated Morne Rita Cave, two Amerindian sites of Marie-Galante (FWI).

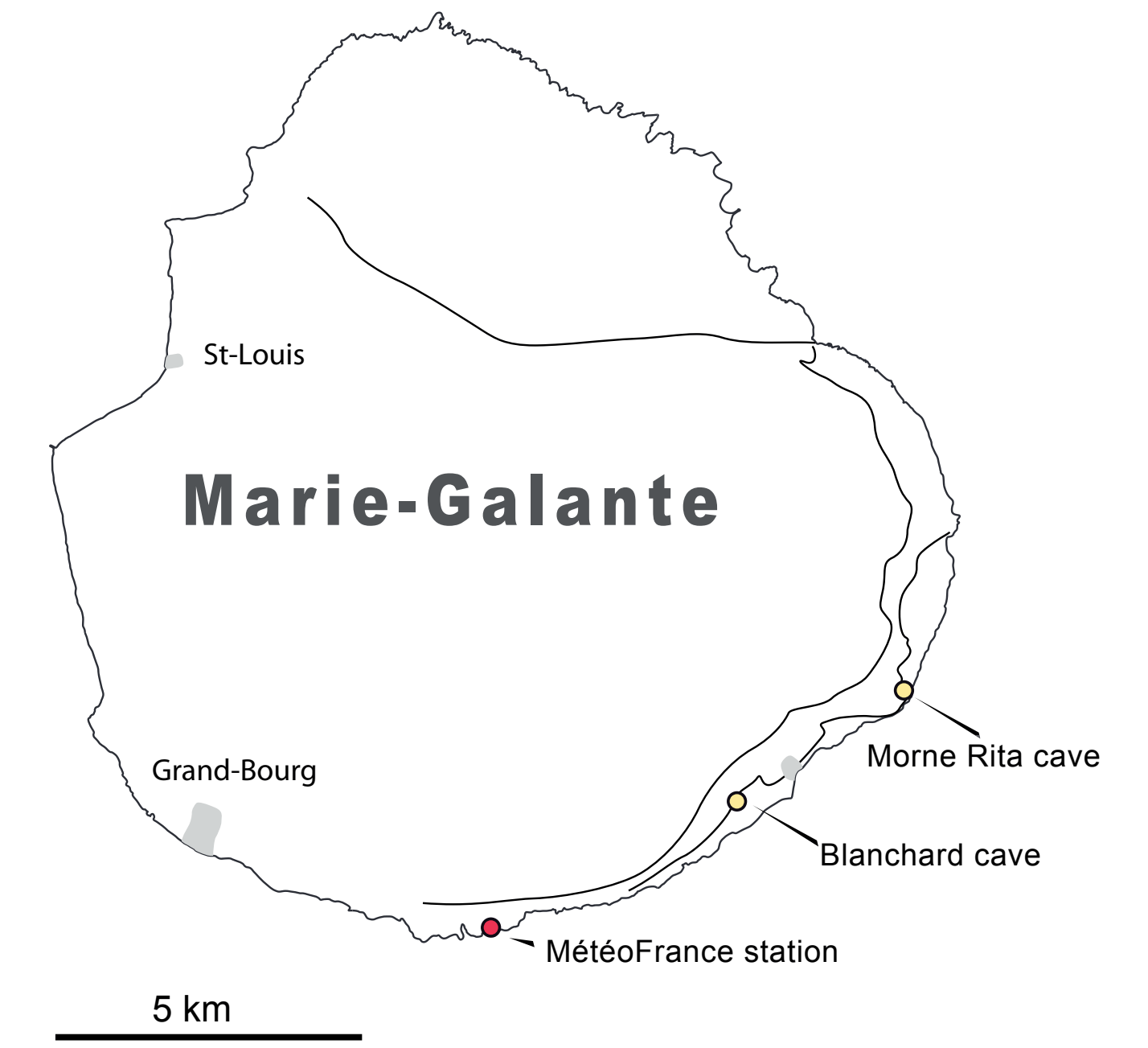
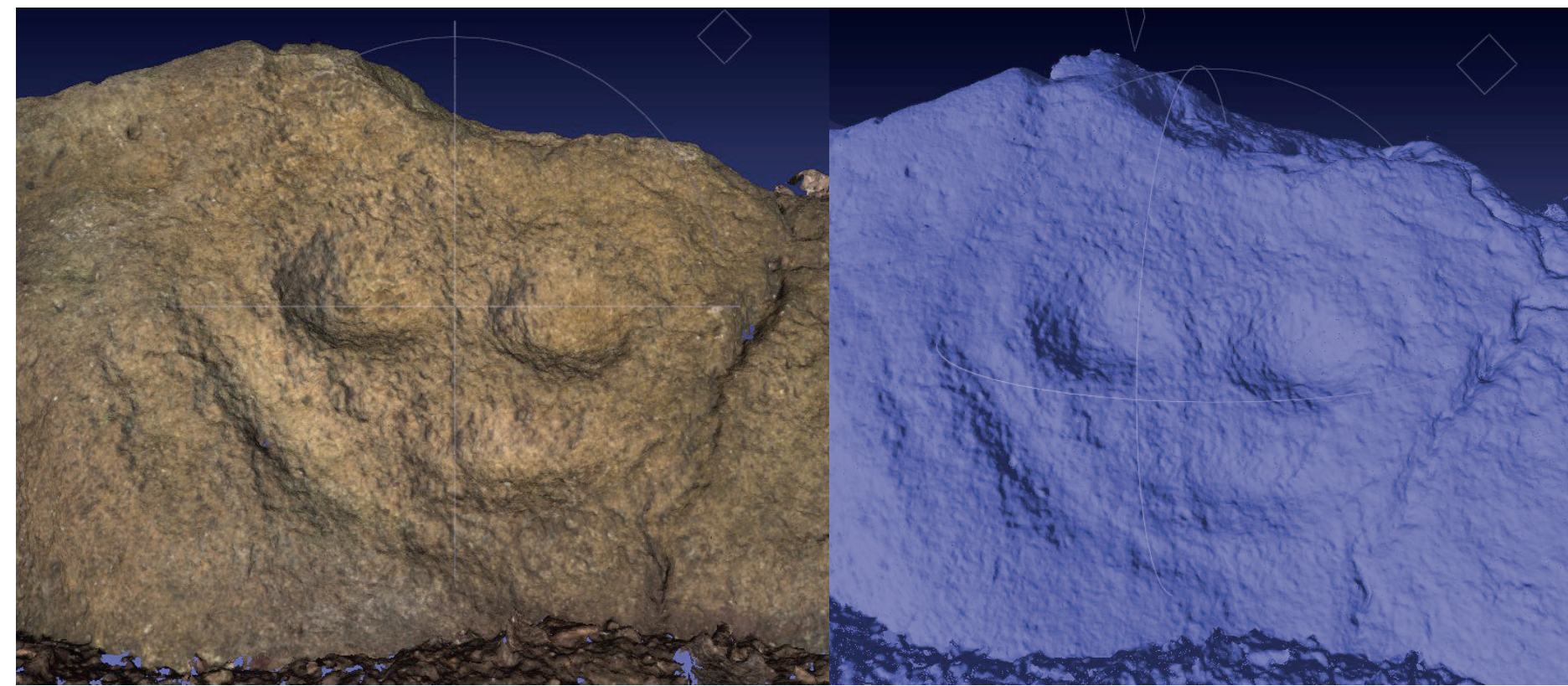
Blanchard Cave

Recent test-pits reveal funeral practice in the entrance part of the site, as well as an occupation of the deepest part of the cave. ¹⁴C datings on bone and charcoal indicate an occupation during the first half of the last millennium (~1000 – 1400 AD). The site contains no engravings or paintings. But it is possible to observe wall morphologies that resemble the so common simple face of the pre-Columbian engravings in the Antilles.



Morne Rita Cave

Many elements of ceramics and bones have been collected, and a three pointer as well. A recent excavation has revealed a burial site, and the collected material ascribes the occupation to the Troumassoid series (~800 – 1500 AD). With 97 known engravings, this cave is the richest of the Lesser Antilles. There are complex patterns in the deep zone of the cave and simple faces on the blocks in the entrance area.



Photogrammetric models in natural and artificial colors of the Blanchard Cave enigmatic morphology (left), and of two selected engravings of Morne Rita cave (center - entrance area, right - deep part of the cave).

Both sites are very similar: bedrock, littoral setting, age of Amerindian occupation, burials occurrence, except their wall decoration. The microclimatic and mineralogical regime of the two cavities does however bring to very different natural patterns.

Daily and annual microclimatic pattern have been established by equipping both caves with temperature/humidity logger iButtons. These recordings have been compared to MétéoFrance data.

The Blanchard cave is very sensitive to external variations. The marine aerosol inputs highlight the occurrence of salt and gypsum crystals on the walls that trigger salt weathering of the rock. The resulting sediment is typically a halite- and gypsum-rich, loose, very light tan silt that accumulates on the cave floor.

The climatic pattern of the Morne Rita Cave is quite different. Few and cold air enters the cave, allowing it to remain very wet all year long. As a consequence, no salt are formed on the walls.

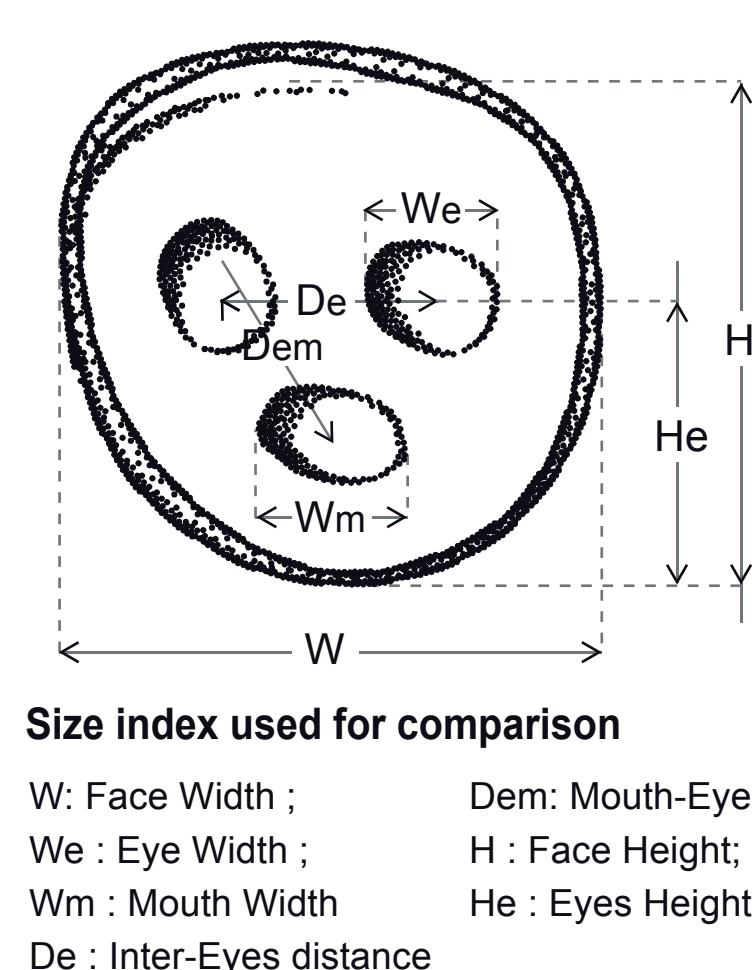
These two distinct patterns are crucial for understanding engravings preservation:

At Blanchard cave, the sediment produced by salt weathering is typically a halite-gypsum-rich, loose, very light tan silt that accumulates on the cave floor. This facies of sediment characterizes the upper 30 cm of the natural deposits, which have been deposited within the last 5,000 years, once the sea level raises its present-day level. This gives a rate of accumulation of sediments produced by weathering of 6 mm / century. Taking into account the expansion coefficient and the ratio between wall and ground surface, we estimate the mean wall weathering of ca. 1.5 mm / century. Such a high rate would explain the disappearance of any Pre-Columbian engravings that might have been produced during human occupation of the cave 1000 years ago.

Air stability in Morne Rita cave, at the opposite, allows the walls to be very well-preserved by preventing any condensation-corrosion.

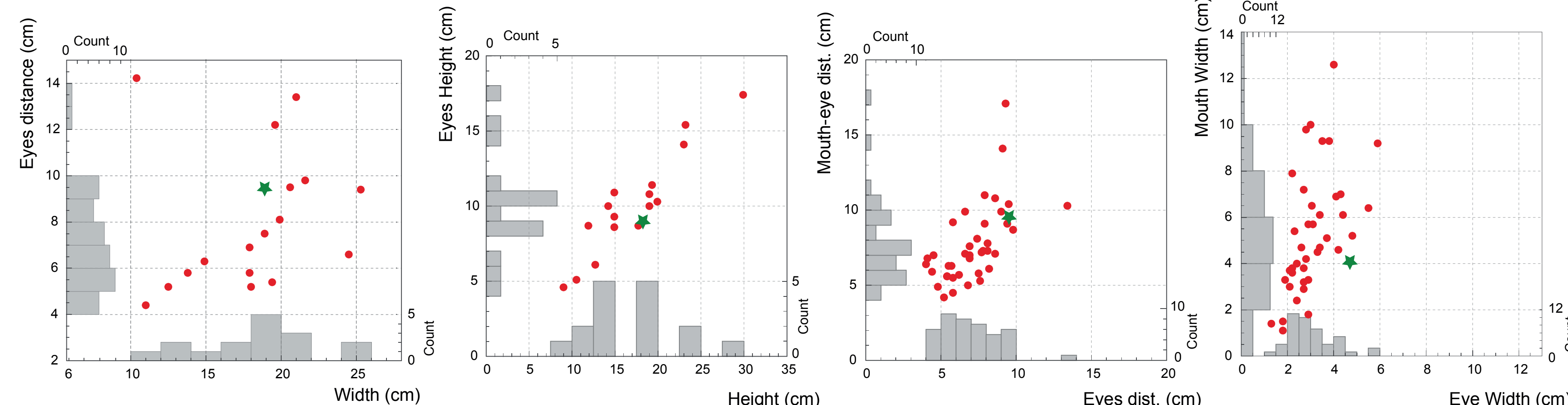
With such a wall weathering rate (~1.5 mm / century) , can we imagine that the wall morphologies observed at the Blanchard Cave represent weathered petroglyphs?

This hypothesis is tested by comparing, by the use of some size index, the Blanchard Cave wall morphology with carved representations of simple faces of the Morne Rita Cave.



Size index used for comparison

W: Face Width ; Dem: Mouth-Eye Distance;
We: Eye Width ; H: Face Height;
Wm: Mouth Width ; He: Eyes Height.
De: Inter-Eyes distance



In these plots, the enigmatic wall morphology of Blanchard Cave (green star) is compared to the engravings size of Morne Rita Cave (histograms) and to the relationship between size index (red dots).

It shows that the wall morphology of the Blanchard Cave is quite consistent with Native American simple face engravings of Morne Rita Cave, both in terms of size and form. Only the cupules corresponding to eyes, when compared to mouth width, have a relatively too large size. Such an enlargement is ascribable to the wall alteration by salt weathering, as illustrated by the profiles provided by 3D models.

Based on these observations, it can be hypothesized that the Blanchard Cave is a degraded petroglyph site.

Conclusion

These preliminary results also help to identify the factors leading to certain types of degradation (size, morphology, nature of the rock and location). Considering that such factors are common in Lesser Antilles caves, a more general theory can be proposed that a number of engraved caves of the Lesser Antilles have not been identified as such. These hypotheses, if proven true, have two important implications for the interpretation of the pre-Columbian decorated caves distribution: 1) an under-representation of the number of known sites and 2) a bias, in the preserved sites, favoring “wet” caves where salt weathering of the cave walls does not occur.

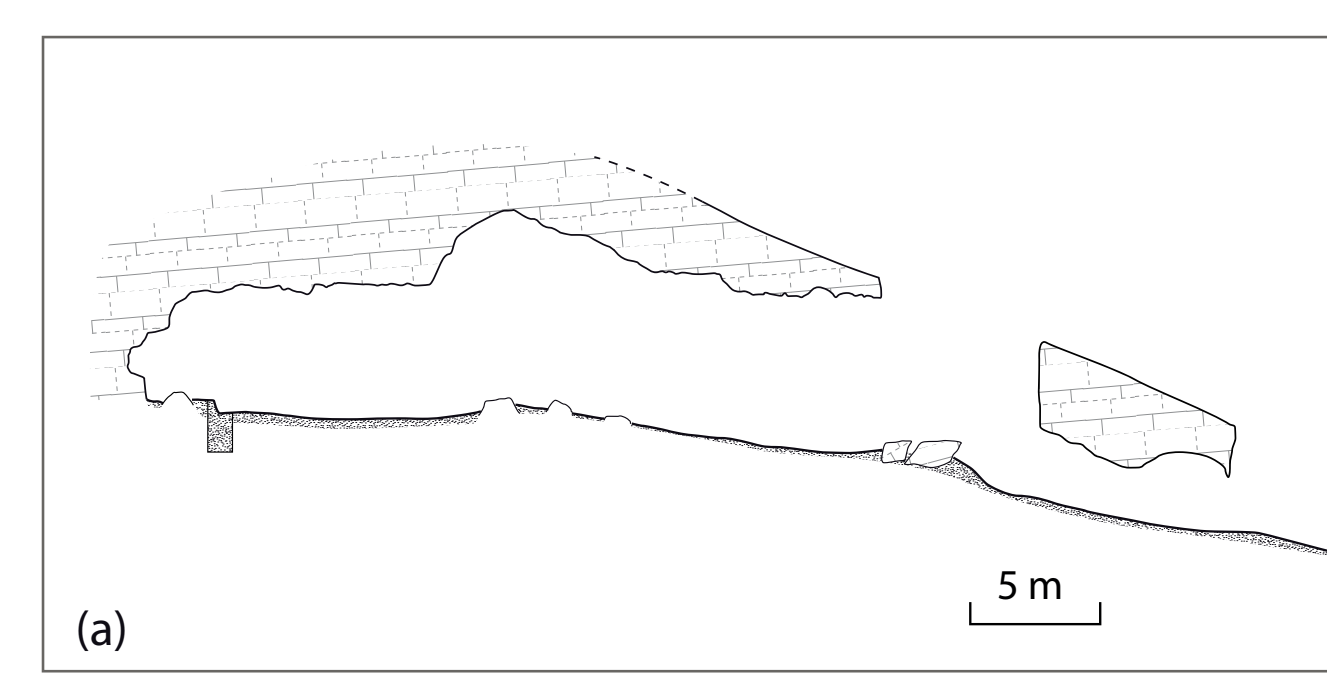


Fig. 1: Profiles of Blanchard Cave (a) and Morne Rita Cave (b)

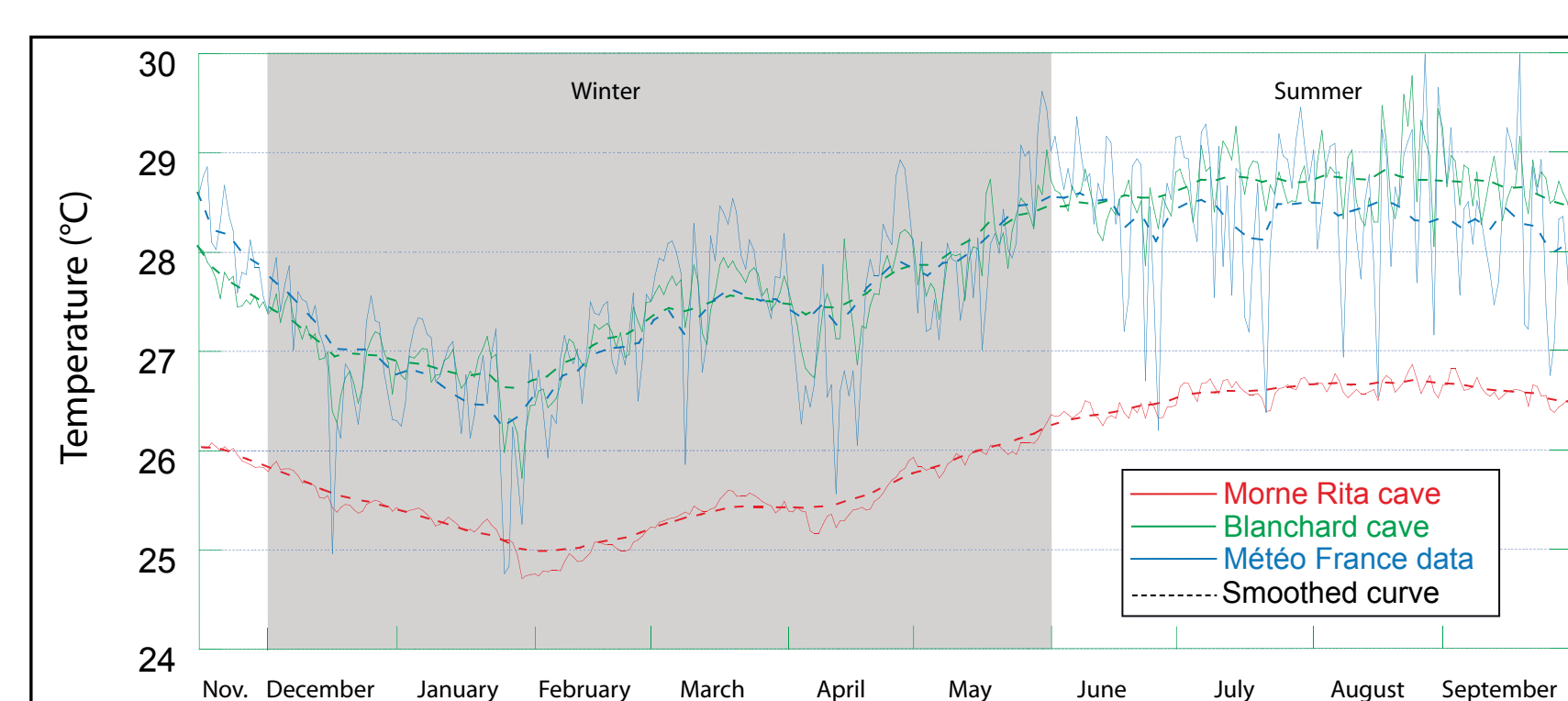
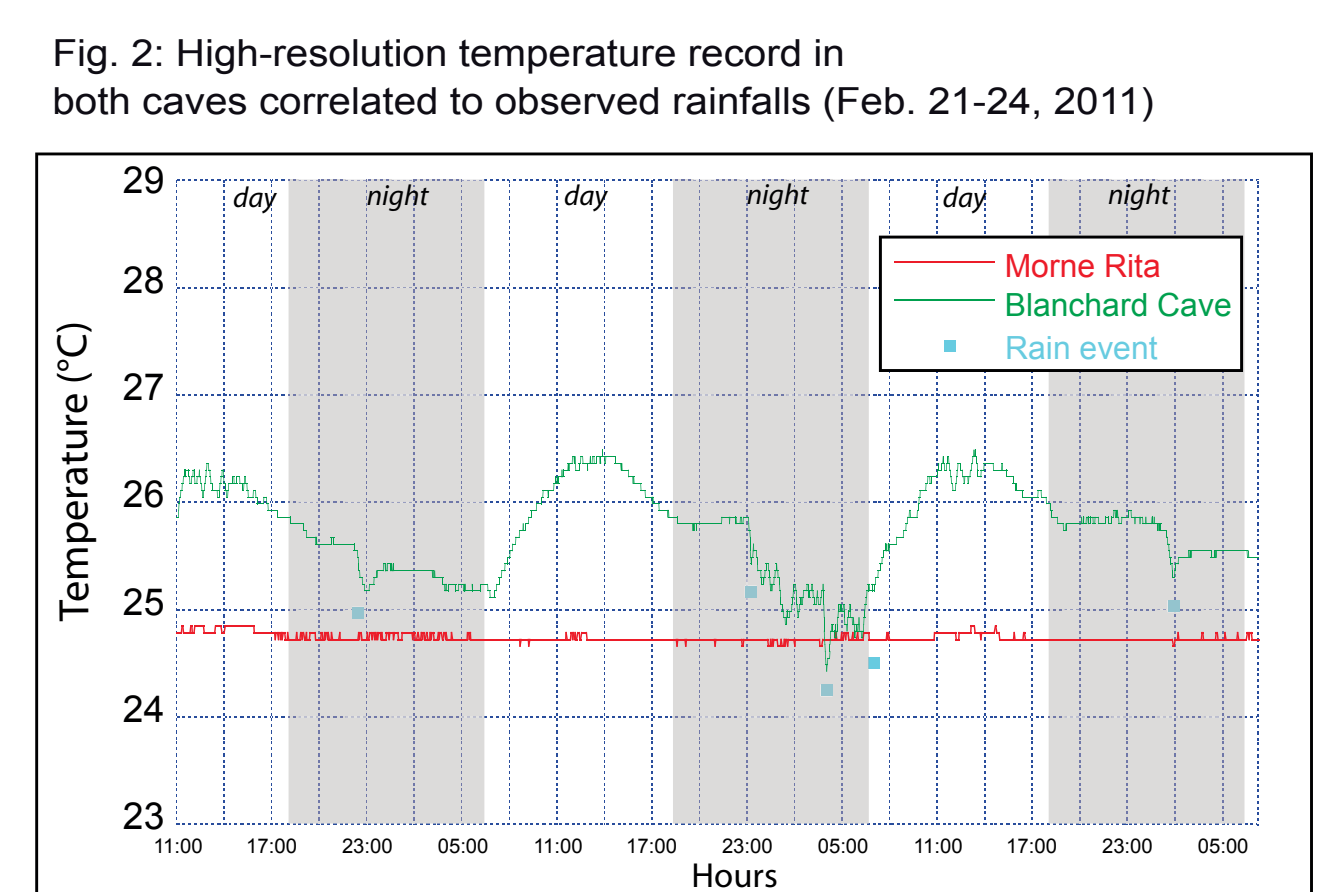
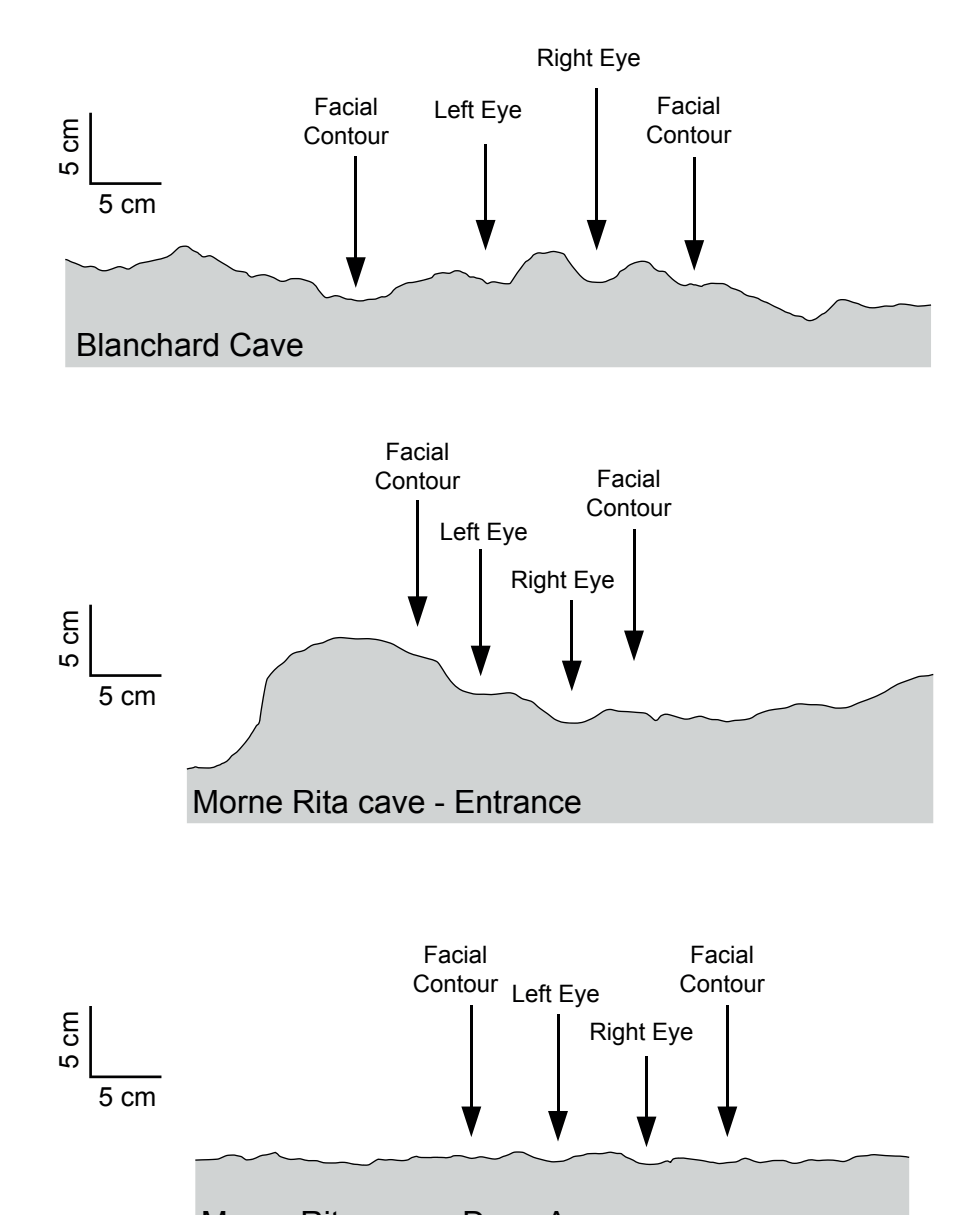
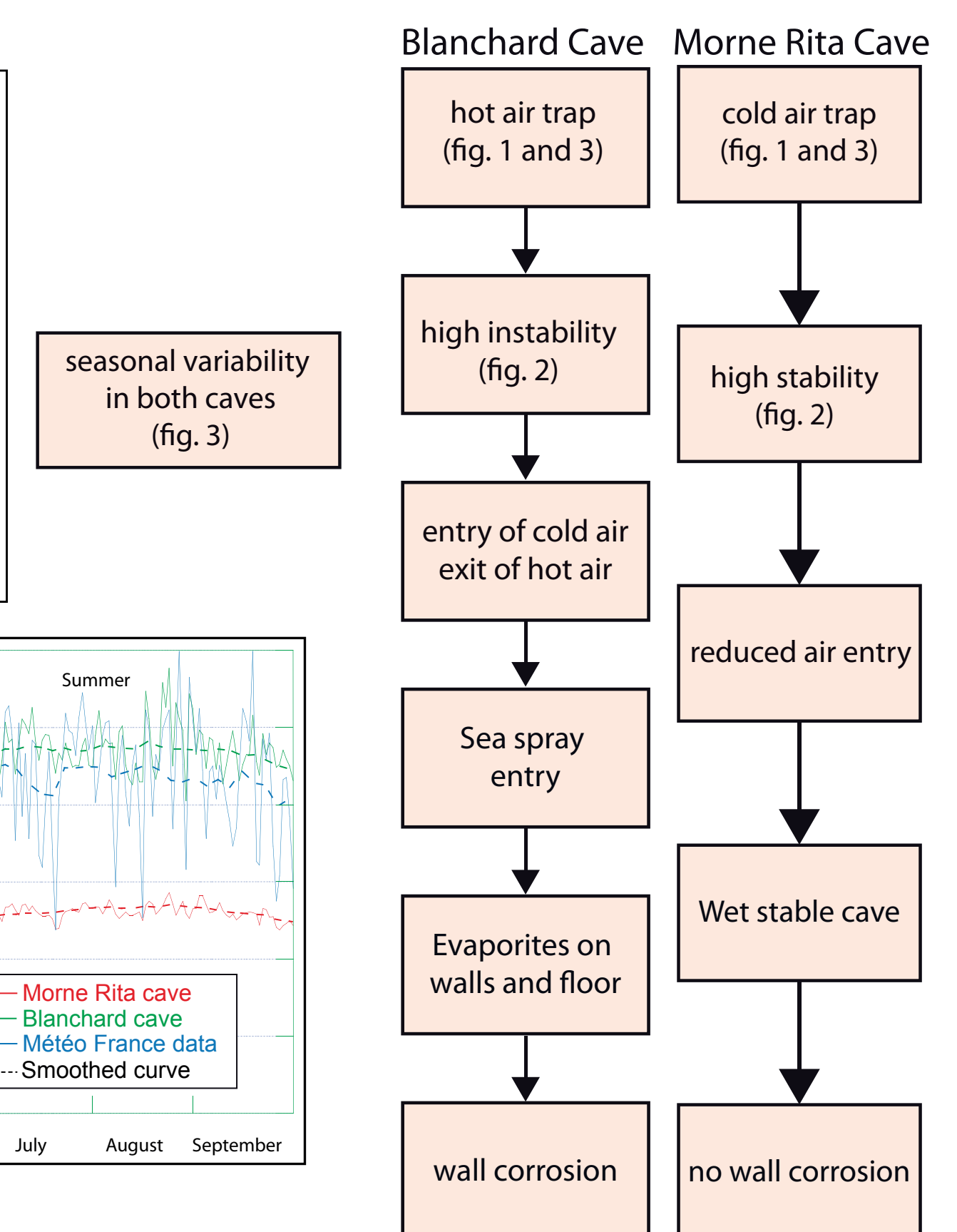


Fig. 3 : Mean daily temperature from the back of both caves and Météo France data between November 2009 and September 2010



Profiles extracted from Photogrammetric 3D models